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ABSTRACT

This paper reports on two research studies. The first study investigates teachers monitoring strategies during computer-assisted composition instruction. The findings reveal four principles underlying a strategic, proximal instruction process. The four principles are collaborative assessment, guided practice, instructional branching, and learner self-monitoring skills development. The computer is described as a cognitive tool supporting and facilitating teachers' active involvement in students' writing process, which represents a change in the traditional process-writing pedagogy that focuses on the analysis of students' writing products. The second study reports on a related issue concerning the design of electronic performance-based assessment systems. The findings are a set of guidelines instructional designers and educators can use in planning for the use of electronic assessment systems. Both studies point to the need for technological solutions to provide efficient, valid, and reliable information to teachers and learners in order to enhance the instructional processes that accompany active, engaged learning experiences. Two figures illustrate: a common interaction pattern between teacher, students, and peers in a computerized learning environment; and the proximal instruction model. A table diagramming the guidelines for management of performance-based assessment and an appendix outlining the guidelines formed in the second study are also included. (Contains 49 references.) (Author/DLS)

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Proximal Instruction Strategies and Assessment Tools for Managing Performance-Based Learning

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Abstract

Educators have not yet clearly described effective methods for implementing and managing performance-based learning experiences that incorporate electronic technology. While we have recognized the benefits of constructivist approaches to learning, the literature says little about the role of the teacher within computerized learning contexts. This paper reports on two research studies. The first research study investigates teachers monitoring strategies during computer-assisted composition instruction. The findings reveal four principles underlying a strategic, proximal instructional process. The principles are collaborative assessment, guided practice, instructional branching, and learner self-monitoring skills' development. The computer is described as a cognitive tool supporting and facilitating teachers' active involvement in students' actual writing process which represents a change in process writing pedagogy found in non-computerized settings focused on analysis of students' writing products, albeit drafts. The second study reports on a related issue concerning the design of electronic performance-based assessment systems. The findings are a set of guidelines instructional designers and educators can use in planning for the use of electronic assessment systems for educational purposes. Both studies point to the need for technological solutions to provide efficient, valid, and reliable information available to teachers and learners to enhance the types of instructional processes that accompany active, engaged learning experiences.

Background and Theoretical Perspective

Educational reform measures call for authentic learning contexts. Technology has the potential to facilitate and support authentic, performance-based learning experiences through its capacity to interactively engage learners. Educators, however, have not yet clearly described effective instructional methods for implementing and managing performance-based learning experiences that incorporate electronic technology. While we have recognized the benefits of constructivist approaches to learning, the literature says little about role of the teacher within computerized learning contexts. In a seminal work, Collis (et.al., 1996) reported findings from three international research studies focused on computers and learning across multiple contexts. In the analysis of the data, the teacher was identified as the critical influence in enhancing students' learning regardless of many variables at the classroom, hardware, and software levels.

This paper reports on two studies addressing issues related to performance-based learning and uses of technology to support it. The first study describes findings from a grounded-theory research study focused on writing teachers' monitoring activities in a computerized learning environment. The findings describe a set of instructional strategies that facilitate proximal instruction and its implications for authentic, performance-based learning experiences. The second study describes the development of guidelines for using technology to help manage the types of data generated from performance-based learning experiences. Standardized assessment methods are inadequate for tracking and reporting educational progress found in performance-based approached to education. That is not to say all standardized testing is out, and alternative assessment is in. Rather, constructivist approaches to learning call for the use of alternative assessment measures 1) to develop the learner's cognitive strategies for self-monitoring of progress, 2) to foster the learner's ability for higher-order thinking skills, 3) to measure progress against the learner's own development, not the norm, and 4) to provide more accurate evidence of a learner's abilities than traditional tests (Boyer, 1995; Cole, Struyk, Kinder, Sheehan, and Kish, 1997; Wiggins, 1993).

The educational reform movement has been strongly felt across educational contexts. The general public wants students to be prepared to meet the challenges inherent in our complex and fast-paced culture, challenges that are often driven by technology. Learning content and context is coming under careful examination to evaluate the

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relevancy and applicability for preparing children to live in a high-tech society. Our technological society requires higher-order thinking skills such as interpreting, evaluating, synthesizing, and communicating new knowledge; problem solving; collaborative teamwork; goal setting; and decision making. Students need to learn how to monitor their own thinking processes and how to use technological systems to manage and convey information. The research discussed in this paper provides a rationale for using proximal instruction strategies and technological management tools to support learner-centered principles in education. Learner-centered principles, which underlie constructivist approaches to education (McCombs, et al, 1993), claim that learning which is closest to the self is the most powerful. This paper provides insight into monitoring strategies and technology guidelines that can assist teachers and student with individualizing instruction and assessment as well as fostering student accountability for learning.

Investigating Teachers' Monitoring Strategies

The literature reflects a historical problem with technology implementation efforts. The problem is that curriculum-making power, historically vested in the teacher, becomes vested in the technology system and overrides the teacher's decision-making abilities, which represents a deskilling effect (Streibel, 1993). Yet the teacher is still responsible for implementation choices at this point in time. Knupfer (1993) argues that "the success of any such implementation effort will depend largely on the teachers who determine the daily school activities" (p. 164). Knupfer criticizes research agendas that focus exclusively on the dynamics between the learner and technology. She also points out that research about the teacher's role in implementation has received little attention, despite "an overwhelming body of evidence [that] points to the centrality of teachers in the process of educational innovations" (p. 165).

In regard to the implementation of computer-assisted composition instruction, Selfe (1990) writes that the computer-assisted composition instruction movement has been accompanied by a pioneering spirit that "remains atheoretical, untested, unexamined, and less than systematic" (p. 191). Likewise Reinking and Bridwell-Bowles (1991) claim that "no comprehensive computer-based writing curricula have been developed" (p. 314). The research conducted in the field of computer-assisted college composition instruction reflects the broader approach of technology implementation efforts--a focus on learner-technology dynamics at the exclusion of learner-teacher dynamics. Curtis and Klem (1992) echo the concern for a lack of research about teachers in computerized teaching environments:

> Our own readings have found a corresponding absence of teachers and actual teaching from the bulk of computer research, even from examination of the computer's relationship to teaching methodology; the focus, rather, seems inevitably to shift to the presence of the machines. We fear that this shift denotes a somewhat odd substitution of computer for teacher as locus of influence, instruction and motivation among student writers (p. 157).

The problem with the shift is that computer systems and programs are not a substitute for social interaction processes relevant to the teaching of writing. During the writing process the writer acts "as a creator of meaning" (Berlin, 1994, p. 19). In addition, the substance of the writing embodies differences in human experiences, values, purposes and goals. Berlin points out the pedagogical value put on fostering writers' individuality.

This section of this paper reports on a research study conducted by McNabb (1996) that had two primary purposes. First, its purpose was to describe the monitoring activities engaged in by composition teachers who are involved in implementing computer-assisted composition instruction. The second purpose was to articulate the pedagogical principles underlying the monitoring activities of teachers in the context of computer-assisted composition instruction. The researched focused on the monitoring activities of teachers during computer-assisted composition instruction with the assumption that teachers' monitoring strategies were key indicators of what facilitates writing skill development in student writers during computer-assisted writing activities. This premise arose from a body of literature about the cognitive writing process grounded in the seminal research conducted by Hayes and Flower (1980). Hayes and Flower identified a "monitor" as a component of the cognitive writing process; the monitor was believed to facilitate recursion between the planning, production, and revision stages of the process writing model. While those in the field of English composition have conducted a vast amount of research regarding other subcomponents of the cognitive writing process model developed by Hayes and Flower, the monitoring component of their model has gone largely unresearched. Nonetheless, others have categorized monitoring as metacognition inherent in the writing process (Flavell, 1987; Perkins, Simmons, & Tishman, 1990; Scardamalia, Bereiter, & Steinbach, 1984). Thus, the research represents an original approach to studying the

cognitive writing process by focusing on the monitoring activities that teachers engage in with student writers during computer-assisted instruction.

Two central questions guided the investigation: 1) What are the characteristics of composition teachers' monitoring activities in a computer-networked learning environment?, and 2) What is the nature of the association between the teachers' monitoring activities and students' computer-assisted writing activities?

Research Method

The researcher employed grounded-theory methodology to gather data about the monitoring activities of teachers during computer-assisted composition instruction. A grounded-theory approach was used to inductively construct a theoretical framework for interpreting the social phenomena understudy (Corbin & Strauss, 1990; Glaser 1978, 1992; Glaser & Strauss, 1967; Strauss, 1987; Strauss & Corbin, 1990, 1994). Research derived from grounded-theory methodology typically provides insight into "patterns of action and interactions between and among various types of social units (i.e., actors)" (Strauss & Corbin, 1994, pg. 278). The patterns of action and interaction between teacher and student and the underlying conceptual processes were the focal point of this research project; hence, grounded-theory methodology suited the research project well. The primary purpose of the study was to describe and explain teachers' monitoring practices during computer-assisted composition instruction. The initial working definition of monitoring was any interaction between teacher and student(s) during the computer-assisted instructional sessions.

The research was conducted through the English Department at a mid-sized public university representative of mainstream American institutions of higher education. The English Department advocated process-writing pedagogy in teaching the traditional freshman composition sequence. The English Department also had a 10-year history of implementing computer-assisted instruction (CAI) in the composition course. The year this study was conducted, the university had implemented CAI into 100% of the freshman two-semester composition sequence. The study occurred in the last six weeks of the second semester of the two-course sequence. Nine teachers and their 180 students were selected for the study. The teachers played three roles in the study. First, the teachers were subjects of the researcher's observation and inquiry. Second, they took on the role of participant observer. Third, they served as key informants for collecting, analyzing, and reporting data. In order to answer the research questions, the researcher designed and used a screening questionnaire to select the participant teachers and designed the initial procedures and instruments for data collection based on perspectives from the technical literature in instructional technology, educational psychology, and composition pedagogy. Teachers selected for participation in the study held important similarities in their teaching practices and beliefs about the writing process and instructional uses of the computer, according to the screening questionnaire. Thus, the data represents the monitoring practices of a relatively homogeneous group, which allowed for the rich variation in monitoring strategies used in computer-assisted process writing to emerge. After selecting the participant teachers, one of each teacher's two assigned course sections was randomly selected for the study. The level of writing skill among the student groups was assumed to be similar, since students were pre-tested by the university and placed into writing classes according to similar writing skills.

In order to answer the stated research questions and to add strength to the design of the study, triangulation of data collection occurred in a naturalistic setting. Data sources included observation of 45 CAI sessions and in-depth beginning and exit interviews with participant teachers. The teachers tape-recorded their naturally occurring dialogue with students during the CAI sessions. They captured students' beginning and ending electronic files on the computer network and transferred the files on to computer disks for archiving. They wrote and submitted key incident reports about their monitoring strategies according to the guidelines that emerged during the study (see Appendix). The key incident reports emerged as a significant data source which illuminated the observations and teacher interviews that the researcher conducted. A student exit survey was also administered. The survey illuminated important characteristics of the teachers' monitoring activities.

Research Findings and Discussion

Analysis of the key incident reports showed an emphasis on tasks requiring students to reflect, evaluate, and appropriate their task performance decisions during computer-assisted writing. Three categories of assignments emerged in the data. These were categorized as organizational assignments, revision assignments, and MLA citation and documentation assignments. The teachers appeared to use these types of assignments as benchmarks for assessing students' developmental level of writing skills. Teachers' monitoring strategies associated with the assignments varied from student to student. Multiple assignments were accessible on the network server for

students to complete at their own pace. Students routinely engaged in the computer-integrated writing activities independently while the teacher monitored their progress. Teachers used a complex arrangement of monitoring strategies to identify students' achievement levels in order to facilitate the students' incremental, or nearby, skill development along a continuum toward instructional goals. Teachers used monitoring strategies to remain in close proximity to the students' developmental skill needs and provided context-appropriate strategic interventions documented in the key incident reports.

Seventeen of the 43 key incident reports describe the use of open-ended monitoring strategies. In these 17 reports, the teachers reported that the student had solved his or her own problem during and/or following monitoring. In-depth analysis of these key incident reports, including the student's before-and-after-instruction computer files and transcribed dialogue, indicated that the monitoring experiences had resulted in the students' autonomous, incremental skill development. Teachers provided written analysis describing the consequences of their interactions with students, drawing from evidence in the tape-recorded dialogue and observed changes in the students' computer-assisted writing performance. A pattern of *descriptive monitoring* strategies emerged in the key incident reports where teachers reported student progress. Descriptive monitoring strategies are characterized by a variety of open-ended cues and interaction tactics used by teachers to elicit reflective, evaluative, and appropriative responses from students.

Another nine key incident reports documented teachers use of directive strategies to help students move forward in their computer-assisted writing tasks. These reports documented that the students had mimicked the teachers' proposed problem solutions. These imitative responses also constituted incremental skill development in the students' computer-assisted writing skills. However, the skill development appeared to be associated with a lower level of learner autonomy. These key incidents involved teachers' *prescriptive monitoring*. Prescriptive monitoring strategies are characterized by a variety of closed-ended comments and explicit demonstrations the teachers used to pose problem solutions, and which typically elicited imitative responses from students.

In six additional key incident reports, the teachers used either descriptive or prescriptive monitoring strategies that did not result in students exhibiting incremental skill development according to analysis of the students' before and after instruction writing. These six reports showed that teachers ineffectively assessed or mis-diagnosed the student's monitoring needs in relation to the assignment tasks and their respective skill level. Consequentially, the monitoring strategies teachers used in these cases were ineffective for the given learning context. The observation notes, unstructured interviews, key incident reports, and student exit survey all indicated that a primary function of teachers' monitoring was to engage students in self-reflection, self-evaluation, and self-appropriation activities aimed at facilitating their ability to solve their own computer-assisted writing problems. The monitoring strategies teachers used represent a complex social-psychological process characterized by diagnostic monitoring strategies, followed by subsequent instructional branching by teachers. Teachers employed a complex schema of monitoring strategies based on individual student response(s) to their monitoring. A dominant characteristic of the instructional process that facilitated the students' incremental skill development was the social interaction between teacher and student. The student survey indicated that, in addition to the social value of personal interactions, observing interactions between teacher and peer(s) often served as a learning experience for students. Figure 1 shows the flow of interactions observed among the participants of the study. During the interactions, the teacher served in three primary roles that characterized the instructional process: co-evaluator, coach, and facilitator.

Teacher as Co-Evaluator

The teacher as co-evaluator put emphasis on the developmental context surrounding students' writing performance. A student's individual stage of development as a writer emerged as a critical factor regulating the teachers' monitoring activities. Stage of development refers to a given student's level of skill in relationship to the computer-assisted writing goal at any given moment during the observed sessions. Teachers reportedly selected their monitoring strategies based on student's developmental skill needs. The teacher acted as co-evaluator during collaborative assessment activities. Peers also played an evaluation role. This was indicated in the student exit survey, key incident reports, and observed activities. At times, teachers' assigned peer evaluation tasks such as online peer critique exercises. At other times peer evaluation behaviors arose spontaneously through student initiated interactions. In order to evaluate students' progress during CAI, teachers employed *collaborative assessment strategies*.

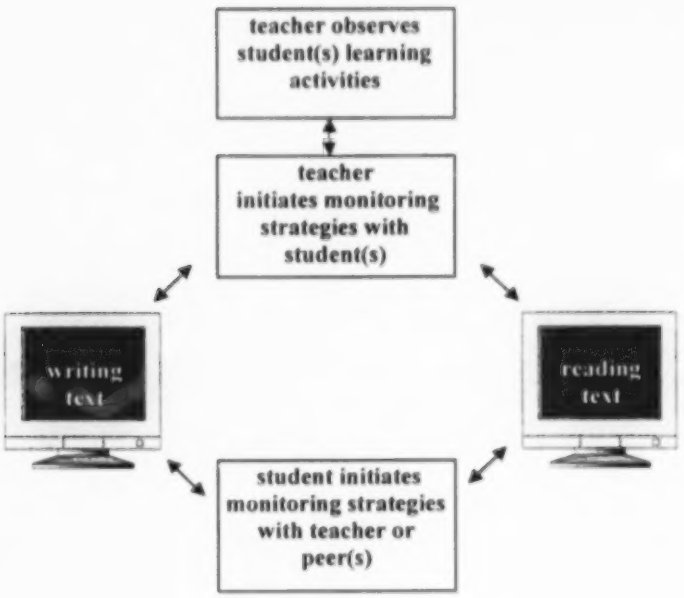

teacher observes student(s) learning activities
teacher initiates monitoring strategies with student(s)
writing text
reading text
student initiates monitoring strategies with teacher or peer(s)

Figure 1. Shows a common interaction pattern among teacher, students, and peers observed within the computerized learning environment.

The reciprocal social interactions between the teacher and his or her students during computer-assisted writing activities fostered contextual learning experiences. The teacher used collaborative assessment strategies to engage the student in overtly identifying his or her instructional needs. Through the collaborative assessment experience, the teacher and student became aware of the student's achievement and/or knowledge level as it related to curricular goals and objectives. The heightened awareness assisted the teacher in making instructional decisions and appeared to prepared the student for learning. The following monitoring strategies characterize collaborative assessment:

- *Roaming*, or circulating around the computer lab arena while students work on their assignments, occurred in conjunction with observing to check students' progress toward learning objectives and curricular goals.

- *Observing* appeared vital to the assessment process, i.e. global observing of the whole group and local individual student and computer screen-specific observing which allowed the teacher to identify each student's progress or lack of progress.

- *Assessment prompts* were used by the teacher to engage students in dialogue and included open-ended questions, leading questions, and exploratory and probing cues, which were designed to facilitate dialogue leading to identifying the student's achievement and/or knowledge level and to clarify any problem(s) hindering student progress.

Teacher as Coach

Another teacher role was that of "coach"; teachers used this word to describe their primary instructional role. Teachers reportedly used coaching strategies to provide students' with *guided practice* experiences. The coaching process found in the data involved the student in performance of a given task while receiving strategic prompts from the teacher. The primary distinction between coaching and evaluating is that coaching refers to instructional strategies while evaluating refers to assessment strategies. In actual practice, the two worked hand-in-hand.

The teacher determined the strategies for guiding student practice of a given writing task based on the insights generated during the collaborative assessment process. The teachers used a variety of context-appropriate descriptive and prescriptive monitoring strategies to help guide the students' active learning. Through reciprocal interactions focused on a particular problem hindering the student's independent performance of a given task, the teacher provided guidance that supported the student's incremental skill development. The strategies listed below illustrate the primary descriptive and prescriptive monitoring strategies found in the data, but are not meant to be a comprehensive listing. *Descriptive monitoring strategies* are characterized by a variety of open-ended cues and interaction tactics used by the teachers to elicit reflective, evaluative, and appropriative responses from their students. For example:

- *Exploring* or *probing* a variety of alternative methods and/or perspectives;
- *Mirroring* back to the student his or her own thinking process through verbal reiteration;
- *Negotiating* the method for accomplishing a task or the meaning of a text;
- *Prompting* the student to think in-depth about his or her ideas and the language used to express those ideas within an argumentative context; and
- *Simulating* contexts for learning that resemble situations calling for autonomous skill performance, i.e., counter-argumentation techniques or Socratic dialogue.

Prescriptive monitoring strategies are characterized by a variety of closed-ended comments and explicit demonstrations the teachers used to pose problem-solutions, and which typically elicit imitative responses from students. For example:

- *Explaining* or *elaborating* on the purposes, beliefs, procedures, rules, and/or conceptual substance of a computer-assisted writing task;
- *Goal-setting* to make explicit the characteristics of a task and/or the subcomponent of the task that acts as a benchmark of achievement;
- *Modeling or demonstrating* for the student how a given task may be accomplished; and
- *Suggesting* specific solutions to a given writing and/or computer usage problem.

Teacher as Facilitator

A third teacher role that emerged in the data was that of facilitator. Although the teachers' monitoring exhibited many characteristics of constructivist approaches to learning, with an ultimate goal of writer autonomy, teachers did use directive strategies to manage the instruction process on an individual learner level and a group level. In their interviews, teachers described the diversity of spontaneous social behaviors among students. The diverse social interactions documented in the researcher observation notes also indicated variation among students. The teachers, through their global comments and more individualized monitoring strategies, set pacing goals that students' continuously modified through reciprocal social interactions. This phenomenon indicated a range of individualized writing processes among the 180 student participants in the study. Differences in writing processes of individual student writers were mentioned in the technical literature as well (Berlin, 1994; Hayes & Flower, 1980; Tierney & Shanahan, 1991). While the characteristics of students' individualized writing processes was not the focus of this research, there was evidence that teachers adjusted their monitoring strategies to a range of student needs for facilitating learning throughout an instructional session. The teacher role of facilitator is characterized by using branching strategies to promote optimal timing and sequencing of tasks and interactions during CAI.

The teachers employed instructional branching strategies to determine the optimal sequencing and timing of the monitoring cues provided to students during computer-assisted instruction. Optimal sequencing of a student's assigned tasks was determined through the assessment-in-instruction monitoring pattern unique to each teacher-student relationship. The teacher's optimal timing for using descriptive and prescriptive monitoring cues, in relationship to assigned tasks, was determined through collaborative assessment strategies. Instructional branching strategies included the following:

- *Effective timing of appropriate monitoring cues* at the student's critical point-of-need in order to facilitate incremental skill development
- *Management of multiple interventions* in a student's task performance activities through individualized, small group, and/or global interactions that may be teacher or student initiated
- *Wait time* following a strategic instructional intervention coupled with observing the student's consequential performance level
- *Open-ended assignment agenda* supported by a computer networked archive of assignments available that facilitated individualizing the instructional process based on the student's progress along a continuum toward curricular goals and objectives

The data showed a relationship between the time a teacher spent engaging a student in various types of monitoring interventions and the student's need for guidance while performing a given assignment. Students with less autonomy associated with a given learning goal typically received more prescriptive monitoring. Those closer to achieving the goal received more descriptive monitoring. When students responded well to prescriptive monitoring, teachers often followed up with descriptive prompts. The decision to change strategies appeared to stem from ongoing collaborative assessment. Figure 2 depicts the instructional process the researcher calls proximal instruction. In addition, the key incident reports and associated transcribed teacher-student dialogues illustrated how a student's inability to respond favorably to descriptive monitoring strategies often caused the teacher's to branch to prescriptive monitoring strategies. This phenomenon indicates the ecletic nature of teachers' monitoring strategies during computer-assisted writing instruction. Ultimately, the teachers' instructional goal was the development of students' autonomous writing skills, skills characterized by self-monitoring.

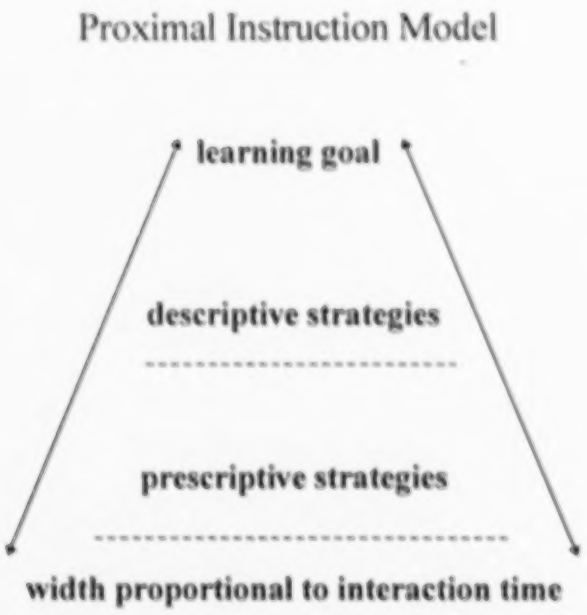


Figure 2. The model illustrates the relationship between the time teachers spent engaging a given student in various strategic interventions and the student's apparent need for guidance while performing a given task in pursuit of a learning goal. The arrows represent the ongoing collaborative assessment-in-instruction and the branching strategies used by the participants.

The students engaged in collaborative assessment and self-monitoring experiences guided by the teachers. During these experiences, the teacher typically challenged the student to reflect on, evaluate, and appropriate solution(s) for a specific problem that was hindering the student's independent task performance. As a result, the student increasingly managed his or her own computer-assisted writing process as much as he or she was able, before soliciting intervention from the teacher or a peer.

This research identified the following three types of self-monitoring skills associated with computer-assisted writing instruction:

- *Self-reflection* involved prompting one's self to explore and articulate one's ideas through writing.
- *Self-evaluation* involved prompting one's self to read and analyze one's written ideas.
- *Self-appropriation* involved prompting one's self to make decisions (including revisions) about the relevance and applicability of one's ideas in a given rhetorical context.

During monitoring, teachers challenged their students to acquire reflective, evaluative, and appropriative skills for writing. The key incident reports and student exit survey results indicated that these three skills were the primary focus of the computer-assisted composition instruction under study. The researcher interpreted the teachers' focus on helping their students locate, understand, and solve their task performance problems as a process of facilitating their metacognitive skills and/or knowledge related to writing ability. Metacognitive knowledge "consists primarily of knowledge or beliefs about what factors or variables [persons, tasks, and strategies] act and interact in what ways to affect the course and outcome of cognitive enterprises" (Flavell, 1979, p. 907). In the substantive area, the teachers' monitoring activities focused on providing students with metacognitive strategy knowledge through interactive, strategic monitoring experiences.

Teachers' monitoring activities resembled characteristics of Vygotsky's zone of proximal development found in the literature (Bruner, 1986; Dixon-Krauss, 1996; Miller, 1993; Vygotsky, 1978). Therefore, Vygotsky's work was selected as a valid developmental theory that informed the development of the principles emerging from this research project. According to Bruner:

> In contrast with learning theories and developmental theories which merely *describe* processes, an instructional theory should *prescribe* the optimal arrangements of conditions which will facilitate meaningful school learning. An instructional theory should be developed alongside learning and development theories, and its principles should be congruent with psychological theories. (Snelbecker, 1985, p. 419)

Additional characteristics from learning theories that appeared to be highly relevant to the teachers' monitoring process were found in literature by Feuerstein and Feuerstein (1991), i.e., the concept of reciprocity between teacher and student, and by Dewey (1939), i.e., the principle of educative continuity. Bruner's guidelines for constructing instruction theory were used to develop descriptions of the four principles of the proximal instruction process: collaborative assessment, guided practice, instructional branching, and self-monitoring skills' development. These principles served to integrate the conceptual categories generated from the analysis of the data collected for this study and provide a basis for further research in this area (Snelbecker, 1985; Miller, 1993).

Teachers monitoring strategies appeared effective in identifying the point at which students were unable to perform independently. The efficacy of teachers' monitoring practices is supported by the following statement from the technical literature: "Considering choices and articulating rationales for particular composing decisions fosters metacognitive awareness--a hallmark of an expert writer" according to David, Gordon, and Pollard (1995, p. 530). Throughout the data were indicators that teachers used descriptive monitoring strategies to foster students' abilities to make their own writing choices, i.e. self-evaluation and self-appropriation. When students were not able to independently make reasonable writing choices, teachers used monitoring strategies to assist and/or guide students' reflection about their decision-making process. David, Gordon, and Pollard (1995) point out that "conscious control of one's own writing processes [is] a feature of expert writers" (p. 530). The students involved in this research were novice writers. Participant teachers appeared to lead students through monitoring experiences conducive to development of their own self-monitoring strategy knowledge and skills.

Characteristic of teacher monitoring was the goal of fostering students' autonomous expression. McCombs and Whisler (1989) explain autonomous learning from a developmental perspective. "Psychologists and educators have increasingly recognized that learning is an internally mediated, active, generative, and constructive process of attending, processing, and transforming information into both relatively stable and dynamic knowledge structures" (p. 277). These researchers point out, however, that learners have varying abilities to assume responsibility for their own learning, which may explain why teachers were found branching from descriptive to prescriptive monitoring strategies based on individualized interactions with students. Furthermore, McCombs and Whisler identify variables involved in the developmental process of becoming an autonomous learner:

> To become autonomous learners, students must develop various cognitive and metacognitive capabilities that allow them to actively process information, attach personal meaning to learning activities, and plan and regulate their own learning activities. At the same time, however, they must also develop cognitive and metacognitive capabilities for controlling and regulating affect and motivation. The development of these latter capabilities depends on the development of self-system structures (schemas for organizing self-knowledge, beliefs, values, and goals) and self-system processes (particularly self-awareness and self-evaluation processes related to personal competence and control). (p. 278)

A predominant theme, in the key incident reports written by the teachers and in their interviews, was the focus on transferring the monitoring responsibility from teacher to student over time. A primary characteristic of the instructional process that emerged from analysis of the CAI goals identified in the key incident reports was the dimension of writer autonomy, facilitating students' ability to fully engaging in discourse communities. This characteristic of the instruction is in keeping with the goals within the field of composition studies identified by many (Balester, Halasek & Peterson, 1992; Hawisher, 1990; Probst, 1990). David et al. (1995) explain: "But to become full participants in such [academic discourse] communities, students need a sense of themselves as writers which can best be developed in a writing course grounded in the assumptions [that] the development of writing ability and metacognitive awareness is the primary objective of a writing course. . . . The students' writing is the privileged text in a writing course. . . .The subject of a writing course is writing" (p. 525, 530). The goals of the curriculum under study aligned with these three assumptions about composition studies.

The collective data showed that the computer makes the cognitive processes associated with students' writing more concrete and explicit for both the teacher and the student. The computer's capacity to make visible previously undisclosed phenomena, in general, was recognized by Zuboff (1988). Zuboff coined the term "informating" to describe the computer-bound phenomena: "The consequences of the technology's informating capacity are often regarded as unintended. Its effects are not planned, and the potential that it lays open remains relatively unexploited. Because the informating process is poorly defined, it often evades the conventional categories of description" (p. 11).

The computer played a significant role in bringing to the foreground of the learning environment the students' actual writing process. The computer was used as a primary tool supporting an instruction approach that allowed the student to engage in process writing activities while the teacher observed and monitored those activities. Assignments drawing on the unique features of the computer were used during the sessions under study. Assignments used a number of word processing features to support student writing activities. These included the multi-file function to display an assignment file and a student workspace on one screen. Assignment files varied from types of models (i.e. prospectus, thesis statements, works cited examples) to exercises (i.e. sentence revision exercises, peer critique directions, question and answer prompts). Students were required to use columns to align argument and counter-argument points and the outlining function to their organize writing. They learned to use the revision tracking function to write and evaluate peer comments. They used the cut, paste, delete and insert functions to facilitate macrostructure revision and the spell checker, thesaurus, grammar checker, and readability index to facilitate microstructure revisions. During all these events, the teacher monitored the students' computer-assisted process and actually became involved in the process, while non-computerized process writing workshops are limited to analysis of writing products, i.e., drafts.

In the computerized environment, student engagement in writing activities freed the teacher to individually monitor and observe student writing progress. In addition, the emphasis on writing activity allowed the teacher to authentically compare students' achievement levels within a peer group. Ultimately, the computer facilitates the instructional process by challenging students to work independently as far as they are able on a given computer-integrated writing task. In this regard, the computerized setting under study facilitated proximal instruction aimed at fostering students' independent writing skills. In sum, the computer-assisted composition instruction provided a

way for teachers to become closer to their students' skill development processes. At the same time, it brought to the foreground hidden characteristics of the writing process. These included reading comprehension, text analysis, vocabulary building, information researching, critical thinking, creative thinking, and computer literacy skills. Some characteristics of the proximal instruction process, as described in this report, deserve further research. Recommendations for further research include:

- The data suggests that prescriptive monitoring strategies foster skill development levels that are antecedent to those fostered by descriptive monitoring strategies; however, the critical junctures and the effects of the various monitoring strategies in relationship to students' developmental writing skill level needs further research.

- The association between teachers' monitoring cues and the learner's motivational propensity, extrinsic or intrinsic, was not verifiable by the data collected during this research project. Further research is need to uncover the nature of the motivational factors influencing writing skill development and self-monitoring.

- The effects of a teacher's monitoring in relationship to the development of a student's metacognitive monitoring skills for writing needs investigation.

This study describes a complex monitoring process used by teachers as they individualized their instructional approach in a computerized learning environment. Findings from this study may inform instructional system designs to assist teachers and student in collecting and monitoring the proliferation of data that emerges when students take an active learning role within the classroom. The next study addresses critical questions associated with designing computer systems for performance-based assessment.

Investigating Performance-Based Assessment Management Systems

The widespread concern that students in the American educational system are failing to learn critical thinking, problem-solving, and reasoning skills, and lack the ability to transfer these skills to authentic tasks has become a focus for our national educational reform agenda. "As it is now, students are rarely taught to learn how to learn - that is, how to 'manage' knowledge so as to effectively store and retrieve it for thoughtful, flexible use--nor are they assessed in such a way as to test their ability to manage available resources" (Wiggins, 1993, p. 84). "Learning to learn" incorporates the use of information and prior experiences in creative and imaginative ways, preferably in a risk-free learning environment that supports thinking. According to Wiggins (1993), this form of thinking is not widely encouraged; therefore, it is no surprise that the development of assessment processes to evaluate this form of thinking has not been a high priority. "Students learn to fear admitting ignorance or being creative. Questionable or imaginative responses, rather than being valued by students as the building blocks of thoughtful understanding, are viewed nervously as potential mistakes" (Wiggins, 1993, p. 73). In order to deal with these concerns, educators and psychologists have been researching various methods of improving both student learning and the assessment of student achievement. "Educational assessment is in a process of invention. Old models are being seriously questioned; new models are in development" (Herman, 1992, p.131). This view is supported by Wiggins (1993) as he cites Norman Frederiksen, a senior Educational Testing Service (ETS) researcher who states: "Most of the important problems one faces in real life are ill structured, as are all the really important social, political, and scientific problems in the world today. But ill-structured problems are not found in standardized achievement tests... We need a much broader conception of what a test is if we are to use test information in improving educational outcomes" (p. 4).

In the wake of concerns about standardized measures, individual teachers, districts, and states are developing new kinds of assessment measures based on performance outcome criteria. In order to gain the necessary assessment data that can provide teachers with accurate and useful information concerning student performance, teachers are turning away from traditional summative evaluation methods toward formative methods of assessment. These methods of assessment are known as authentic assessment, alternative assessment, and performance-based assessment. These terms are often used interchangeably with each other; however, they are not the same. According to Marzano, Pickering, & McTighe (1993, p.13), authentic assessment, popularized by Grant Wiggins (1989), conveys the idea that assessment should engage students in applying knowledge and skills in the same way they are used in the "real world" outside of school. Alternative assessment applies to the variety of assessments that differ from the multiple-choice, timed, one-shot approaches characterized by most traditional standardized and classroom assessments. Finally, performance-based assessment, according to Marzano, Pickering, & McTighe (1993, p.13), is a broad term encompassing many of the characteristics of both authentic assessment and

alternative assessment. The Office of Technology Assessment (OTA) defines performance-based assessment of the U.S. Congress (1992) as "testing that requires a student to create an answer or a product that demonstrates his or her knowledge or skills". Performance-based assessment requires students to "do" something as opposed to taking an objective paper-pencil test. It zeros in on what a student's strengths are and what a student needs to learn, and requires students to actively accomplish complex and significant tasks based on experiential learning and relevant skills to solve realistic or authentic problems. "...Assessment(s) in context have 'ecological validity'--that is, students perform as they will have to in life" (OERI, 1990. p. 1). This assessment process is designed to present a broader, more genuine picture of student learning.

Performance assessment, as defined by Mitchell (1992, p. 20), is "a collection of ways to provide accurate information about what students know and are able to do or about the quality of educational programs." Assessment, therefore, should be seen as a motivational component to give both the teacher and the student the necessary feedback to enhance the learning process. Hence, "Assessment...becomes a part of the instruction, even when the results of assessment are also used for accountability" (Mitchell, 1992, p. 21). When assessment and instruction are viewed as a simultaneous process, as in performance-based assessment, the learner is provided with a clear understanding of the criteria necessary to confidently complete his/her task successfully. The establishment of an accepted set of criteria for the measurement of a performance-based activity or project requires standard procedures and/or methods in data gathering. The use of uniform procedures and/or methods for data gathering are not meant to place constraints on teachers' qualitative judgment of the content to be addressed in the assessment process. It is meant to help in identifying the basis of measuring or judging the process as well as the product of a student's activity. "An emphasis on content without process means honoring the ends, not the means, of education" (Costa & Liebmann, 1995, p. 23).

Classroom teachers find themselves in an instructional environment that demands that they face myriad changes in content, context, and delivery of information to students. These changes have affected not only the classroom instructional environment, but also have impacted management issues dealing with the collection of student assessment data. The ability to access assessment data from multiple sources in a time efficient manner and the ability to interpret, synthesize, and apply the information are rapidly becoming major challenges for the classroom teacher. The need to manage student assessment data is critical for effective educational diagnosis and is an important component in today's climate of academic accountability. The data gathering process for performance assessment must be consistent and systematic in order to acquire reliable and valid data concerning student performance. Performance-based assessment data is collected through the use of anecdotal records, journals, rubrics, portfolios, projects, presentations and/or interviews. This form of data gathering is complex, potentially massive, time consuming, costly, and is inherently difficult to manage with a class of twenty-five or more students. Therefore, if performance-assessment is to succeed, support for the classroom teachers to effectively collect and manage performance-based assessment is a strategic management issue facing the educational system.

An area that offers great potential for meeting the management problems created by the vast amounts of complex data is technology. However, in the search to find effective solutions, educators must be weary of vendors touting packaged solutions too quickly. Just as performance-based assessment is unique and complex, so is the process of collecting and managing the data. Through the use of technologies such as computers, computer software, scanners, and handheld PCs, the intricate process of collecting, managing and interpreting performance-based assessment can be addressed. Many software designers have recognized this educational market and have eagerly entered the educational field with various assessment management software programs. The majority of these programs are designed using database and/or multimedia programs. Both applications have the capability of solving the management issues involved in performance-based assessment. However, a major concern surrounding these management programs is many designers have only a surface level understanding of the intricacies involved in performance-based assessment as a component in the total schema of a classroom environment.

The classroom environment is unique to each class of students, school, and teacher therefore a performance-based assessment management system aimed at meeting classroom assessment management needs should include components geared towards the classroom. The purpose of this study is to examine the impact of technology on performance-based assessment and to determine ways to infuse it into the educational process in order to solve the management issues facing the classroom teacher. This study is intended for designers, researchers, administrators, technology coordinators, and/or classroom teachers interested in understanding the impact of technology on the management of performance-based assessment.

The research questions addressed in this study were 1.) How can technologies such as videos, computers, scanners, and others provide standardization of the assessment process, ensure time-effectiveness, and identify cost

efficient methods for the facilitation of classroom management of performance-based assessment? 2.) How can technologies improve reliability and validity in the performance-based assessment process? 3.) What type of guidelines can be developed in order to: 1) provide standardization of the assessment process, ensure time-effectiveness, and identify cost efficient methods for the facilitation of classroom management of performance-based assessment? 2) improve reliability and validity in the performance-based assessment process?

Research Method

The methodology used in this qualitative research study was inductive analysis. Inductive analysis, according to Patton (1990), "...means that the patterns, themes, and categories of analysis come from the data; they emerge out of the data rather than being imposed on them prior to data collection and analysis" (p. 390). This research study was conducted in four stages to fully identify the patterns, themes, and categories of analysis.

First stage included an extensive literature review and document analysis that provided the framework for three sensitizing concepts to emerge. A more extensive research of the three sensitizing concepts provided indigenous typologies to emerge. The characteristics or attributes that comprise the indigenous typologies of the categories within the identified sensitizing concepts were then used as the criteria in a rubric. This rubric was then used in Stage Two and Three as an analysis tool. It was used to analyze five assessment software programs as well as provide a guide in the conversational interviews that were conducted. The interviewees included designers of software programs, consultants representing the five performance-based assessment software programs, and teachers who had either used or were currently using one of the software programs in the study. The data from Stages One, Two, and Three provided the foundation necessary for Stage Four, determining the findings of the study and presenting the results of the study, a set of guidelines for the management of performance-based assessment.

Research Findings and Discussion

The results of this study are proposed guidelines for the management of performance-based assessment. The design of the proposed guidelines is the result of a multi-level research process. This multi-level research process surfaced the information needed to develop comprehensive guidelines that utilize technology to effectively manage performance-based assessment and thus positively impact the work of the classroom teacher. The guidelines developed from this research consist of four basic components: (a) standardization of process; (b) time commitment; (c) cost; and (d) operational features.

Acknowledging and documenting the multi-dimensional learning, thinking and performance capabilities of all students engaged in performance-based tasks requires a practical and flexible assessment management system. The ability to systematically organize large amounts of complex assessment data is critical for the success of performance-based assessment. Therefore, the following guidelines have been developed to assist educators/administrators, technology coordinators, software designers, and/or researcher involved in selection or design of performance-based assessment management programs. The guidelines bring together the various components of performance-based assessment that range from obvious and commonplace issues to those that are somewhat technical and specialized. In addition, the guidelines provide a framework from which to determine the worth of an existing performance-based assessment system/program or to use as a guide in the development of a new program for effectively managing performance–based assessment. A graphic of the guidelines is located in Table 1.

The guidelines for the management of performance-based assessment consist of four basic components: (a) standardization of process; (b) time commitment: (c) cost; and (d) operational features. The first and most critical of these components is standardization of process. A performance-based assessment management program must have a consistent system that ensures validity and reliability in assessment situations as well as a historical or benchmark representation of student progress. In the proposed guidelines, the issues of accuracy, multiple samples, data gathering flexibility and consistency are addressed to ensure a valid assessment process that reflects what a student knows or can do. The issues of data entry, replication, historical review, and training are addressed to ensure the reliability of an assessment process. Reliability involves establishing a clear understanding of the criteria and standards to be used in the assessment process through the recording of assessment data using a rubric, anecdotal and journal notations, video clips, photographs, hand drawn pictures, or written reports. The ability to record assessment data using a variety of methods enables a deeper understanding of students' progress; it also gives a clearer picture of students' current, as well as historical, academic, and social progress. The ability to review student progress over time is a powerful tool in the academic and social development of the whole child. Capturing student progress through careful data gathering over time enables teachers to gain insight into the progress and

development of students who, for example, may be struggling, may have recently moved into the school, or who may have exhibited changes in learning habits.

While the capability of multiple data entries allows for a more comprehensive picture of student progress, it can also negatively impact consistent replication of student assessment results. Preparing teachers to become more accurate and consistent in gathering and documenting assessment data is critical to the success of any performance-based assessment program. The need for accurate and consistent replication of assessment results drives major issues in developing a well-designed training program. A carefully and systematically designed training program supports teachers in the implementation of performance-based assessment and helps to ensure that the same rating can be replicated for a given student by another teacher at another time, thus supporting the reliability of the assessment program.

This systematic training can, in theory, increase teachers' confidence in their ability to utilize performance based assessment by providing both the tools and the skills to use up-to-date and accurate data in an effective way. As confidence grows, utilization expands and along with it follows efficiency, actually giving teachers time to reflect on the delivery of information, on content, or on a combination of the two. Engaging in an effective reflection process allows teachers to more clearly identify and modify educational goals in a timely manner, making adjustments to curriculum as the need becomes apparent. For years students have been given standardized tests, but the results were not returned to the classroom teacher until the following school year, too late to effect any changes which would positively impact student learning. Having the skills to use ready access to assessment information about the process, progress, and final product of students' work should greatly enhance teachers' confidence in their ability to make meaningful curricular adjustments and in their overall view of themselves as effective professionals.

The guidelines address time commitment on two levels: the time required to learn disciplined use of an assessment program, a potential perceived negative, and the time saved and accuracy gained by use of an assessment program, a clear positive. The first issue is addressed by devising a training plan with an appropriately designed learning curve so those teachers are challenged without being overwhelmed. The remaining, and most important, issue involves how teachers recognize the relevance and usefulness of a truly functional assessment management program. As teachers' data gathering and documentation skill levels increase, the amount of time required to collect and manage extensive amounts of assessment data will decline. They will begin to realize and welcome the power of systematically analyzing and utilizing assessment data for diagnostic purposes to improve the learning process, as well as to enhance accountability. Gradually, teachers will begin to understand the time saving value and the improved quality of information input and output with an assessment program designed with the use of the proposed guidelines.

Conceptually, standardization of process should be viewed as the critical component in the guidelines. Practically however, the critical component is often the initial and ongoing cost of the program. The proposed guidelines point out the need for a clearly defined cost structure that addresses the needs of single users and small or large school districts. Incorporating a flexible yet clearly defined cost structure provides single users as well as district users the option of customizing or phasing in a program. In this way, districts can purchase only what they need or can afford, thus optimizing the use of available monies.

Finally, the operational features of the guidelines are both practical and futuristic. The idea of connecting the schools electronically to the rest of the world opens up new educational frontiers for students to enter and learn. Connectivity offers the ability to learn in new and exciting ways with learning partners never before available to students in grades K-12.

Along with new learning opportunities, connectivity presents major challenges for the classroom teacher in effectively assessing learning in this new electronic learning environment. These assessment challenges can be met by first gaining a thorough knowledge of performance-based assessment. Initially designing assessments instruments to support and complement tasks performed in an electronic environment for students to achieve their goals will greatly enhance both learning and the assessment of learning. The systematic and organized integration of the components of connectivity into the assessment process will lay the groundwork for the next logical step, which is the connectivity of our schools to the vast possibilities of learning available to them through e-mail, bulletin boards, home pages, and the WWW. It also opens up a new vehicle for communication with parents, teachers, administrators, colleagues, community libraries, local government, etc. that will be of great practical benefit.

Theoretically, connectivity has the potential to both narrow and broaden communication between the home and school. It can narrow communication if parents and teachers resort to strictly "on-line" communication. The negative impacts of using only this form of communication are that 1) many individuals find it difficult to fully express themselves in written form, 2) the loss of face-to-face contact can negatively affect communication due to

the inability to interpret subtle messages expressed through body language, and 3) if the conversation is not "live-on-line", the spontaneous reactions or attention may be lost, thus limiting communication. Connectivity can broaden communication through the ready access available to both parents and teachers "on-line".

Communication between teachers and parents is difficult during the school and workday. E-mail allows interested parties to send messages at any time that can be received and answered at a convenient time. Teachers can electronically send the same message to all students simultaneously or can write short notes to parents concerning the successes as well as difficulties of individual children to keep parents abreast of classroom activities and conduct. Finally, teachers or parents do not have to be in a specific location to communicate with each other. If a parent travels, he or she can log on to receive updates about their children's progress and respond from anywhere in the world. These positive and negative scenarios must be dealt with as a natural outgrowth of change. The pace of change is increasing at an exponential rate resulting in boundless opportunities for those who are prepared. Education should provide that preparation by forging ahead to set trends in learning that extend beyond the walls of the traditional classroom.

The assessment process is an integral part of learning and teaching. Performance-based tasks allow students to show the process as well as a final product of a learning situation. In this form of learning the assessment is no longer a mystery, but an understood standard by which to measure student work in progress. Demystifying the methods of assessment enables the learning process to take on new meaning. One where risk-taking is encouraged in order to extend critical thinking and reasoning skills beyond the expectation of "making a grade" based on recall and identification to an active, engaged performance or demonstration of ability. The methods involved in performance-based assessment are seen as tools in the learning process for both the student and the teacher in order to improve and encourage the process as well as the end product of learning.

Performance-based assessment is not a panacea; in fact, it holds many challenges for the educational community. If done in its true form, performance-based assessment generates large amounts of complex assessment data that require careful and systematic organization in order to assist with and measure student learning. The development of a performance-based assessment management program rooted in the proposed guidelines can be of great benefit in solving many of the challenges faced by the classroom teacher as well as in the overall learning process.

Students must be prepared to compete in the workforce of the future, adapt to diverse learning contexts, and collaborate with others on a variety of local and global levels. The ability to assess their own work in progress, as well as their own final product, will be an essential asset for the student of today and the worker of tomorrow to possess. "Workforce know-how will be part of the new World Class Standards. However, defining competencies and a foundation is not enough. Schools must teach them. Students must learn them. And, they should be assessed as part of the AMERICA 2000 agenda" (SCANS report for America 2000, 1995, p. 12).

Educational Implications from the Studies

In school districts implementing technology into the classroom, teachers find themselves faced with demands requiring changes in content, context, and methods of instruction. The research investigating teacher's monitoring activities a performance-based learning environment found that when learners become actively engaged in learning tasks a rich variety of learner characteristics and variables come to the foreground of the instructional arena. Learner characteristics emerge that are not readily apparent in traditional chalk-talk-textbook instruction where students play a more passive, receptive role. Because learning becomes more individualized, students must learn to metacognitively manage and direct their learning activities as much as they are able in order to be active participants in authentic learning tasks. The research suggests ways in which performance-based learning events can be structured so that teachers, students, and technology systems effectively assist the development of self-regulatory learning skills.

While authentic, performance-based learning tasks are associated with technology implementation, the changes that implementation cause in the classroom challenge the teacher with new classroom dynamics to manage. Proximal instruction describes instructional strategies for managing the social interactions within a computerized learning environment. Changes brought about by technology not only affect instructional methods, but also impact management issues related to student assessment of learning. The ability to archive, synthesize, interpret, and apply relevant assessment data from performance-based learning events in a time efficient manner is also a critical concern associated with implementation of technology in the classroom. The proposed guidelines derived from research bring together the various components of performance-based assessment that range from the commonplace to

technical issues influencing the design, implementation, and utilization of performance-based assessment management systems that can greatly improve the overall learning process.

Performance-based learning is a complex, individualized educational approach that requires different instructional strategies and technological tools to support and properly implement. In this paper, the authors have presented research finding and draw the following conclusions.

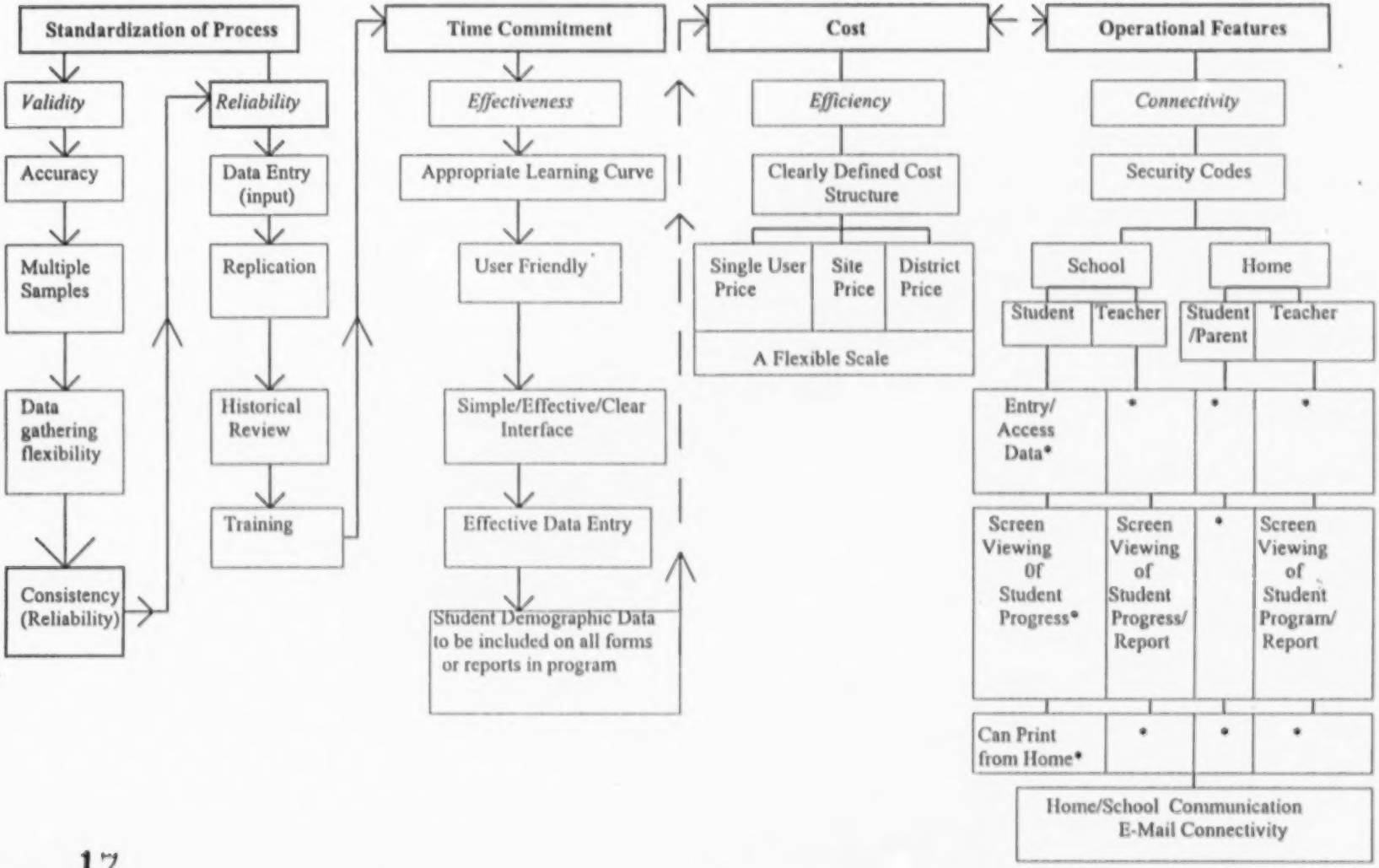
- Technology systems need to be designed in congruence with teachers instructional approach in order to facilitate student's proximal development toward an instructional goal.

- The monitoring strategies and the system design guidelines presented in this paper need be contextualized to fit different instructional goals in different content areas.

- The descriptions of the proximal instruction process and the performance assessment system guidelines may provide interested individuals with insight into factors to consider when making instructional design decisions.

The research studies identify the need for technological solutions to provide efficient, valid and reliable information available to facilitate the types of instructional processes that accompany active, engaged learning experiences. The research studies identified the importance of designing flexible technology systems capable of supporting open-ended instructional approaches and providing contextual feedback to a wide variance of learners.

Table 1. Guidelines for the management of performance-based assessment.



Appendix A

These guidelines emerged from analysis of the data during the first three weeks of the six-week study. Teachers were given updated guidelines on a weekly basis. The primary researcher generated the guidelines from analysis of the incoming key incident reports each week, until the key incident criteria reached saturation point. Each key incident addressed the following five questions.

Question 1: Describe the conditions in which your monitoring occurred. Elaborate on these conditions of the monitoring activity with respect to the aspect(s) of the assignment or the writing problem(s) your monitoring addressed.

- identify student's prior knowledge of concepts in the assignment;
- explain student's prior use of computer functions in the assignment;
- explain your familiarity with and purpose for using the assignment;
- indicate when other students listened to or observed the key incident.

Question 2: Describe your interactions with the student that embody your monitoring activity. Elaborate on the meaning of these interactions captured by the dialogue on the tape recording.

- identify who initiated the interaction;
- explain why the interaction was initiated;
- describe the focus of the interaction.

Question 3: Describe the monitoring strategies and tactics you used to instruct the student. Elaborate on these strategies and tactics that you intentionally used to intervene in the student's writing process.

- use action verbs that describe your monitoring activities, i.e. roaming, circulating, observing, reacting, intervening, questioning, probing, coaching, directing, prompting, supporting, motivating, suggesting, exploring, explaining, simulating, modeling, negotiating, goal-setting, mediating, challenging, etc.
- describe any combination of strategies you used with the student;
- define each strategy, i.e. the substance of the monitoring;
- describe your purpose for using each strategy, i.e. to detect, to diagnose, and/or to descriptively or prescriptively treat a problem the student is experiencing.

Question 4: Describe the consequences of your monitoring that are evident from the student's drafts. Elaborate on these consequences apparent in changes that occurred in the student's draft as a result of your monitoring activity.

- focus on the effect(s) of your monitoring on the student's computer-generated writing.

Question 5: Describe any self-monitoring you observed the student engaging in as a consequence of your monitoring activity. Elaborate on the student's self-reflection about the writing problem as a consequence of your monitoring.

- use action verbs such as articulating, reflecting, exploring, goal-seeking, goal-setting, goal-achieving, regulating, planning, organizing, generating, revising, evaluating, transferring knowledge, etc.

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